



## Mining

Designed for the future.  
Built for your success.



*Power. Passion. Partnership.*



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#### 1 Technological leader

As a supplier of high-quality, performance drive solutions, MTU stands for the highest level of technological expertise.

#### 2 Passion

MTU is passionate about fulfilling the needs of its customers with the utmost professionalism and precision.

#### 3 Partnership

MTU is a reliable and trend-setting partner which acts with foresight in a results-oriented manner.

## A customer-oriented technological leader.

MTU supplies its customers with technologically-advanced products that are proven in the field. MTU's range of products and services for off-highway applications is extensive and includes both standard and customized solutions.

MTU is the part of the Rolls-Royce Group and a world-leading provider of high- and medium-speed diesel and gas engines, complete drive systems and distributed energy systems for the most demanding requirements.

The product range of MTU is one of the widest and most modern in the sector. We offer comprehensive, powerful and reliable engine solutions for yachts, commercial ships and naval vessels, construction and industrial vehicles, agricultural machinery, mining, rail and military vehicles as well as for the oil and gas industry. We also provide a full line of service products to help you maximize uptime and performance.

For over 100 years, MTU has been known for cutting-edge innovation and technological leadership. That same spirit of innovation inspires our sustainability efforts. Today and in the future, our focus is on developing and implementing system solutions to maximize efficiency and meet emissions standards.

#### **An expert in technology**

MTU has always set standards in technological expertise for customized product and system solutions. To deliver you maximum power density, we concentrate our innovation on the continuous advancement of our core competencies: turbo charging, exhaust aftertreatment and electronics.

#### **A passionate engine specialist**

We spend every day working together with you, our customers, to deliver engines and systems that best fit your needs. Whether a standard system or a customized solution – we are passionate about the art of engine creation.

#### **A reliable partner**

We understand the specific demands for diverse applications. In collaboration with you, we look for the solutions which are best suited to your individual requirements. Every step of the way – from the start of project planning, during the design of your integrated system solution, at the point of delivery and commissioning and continuing through the care of your product – we are there with you for the entire lifecycle.



Power for Mining

## The power to take you forward.

Mining has its own laws and challenges. Huge stretches, immense masses, extreme temperatures, unimaginable tasks: Whoever wants to prove themselves in these situations – whether human or machine – must be strong, hard, tough, and persevering. A challenge that only a few master. We are amongst them.

### Fully tried and tested

Our engines have a long history of proving themselves in mining applications around the globe. Day in and day out, under extreme conditions, in hard continuous operation.

As leaders in quality and tested in practice a thousand times over, our engines first of all feature impressive reliability and availability. Furthermore, low life cycle costs due to efficient operation, low fuel consumption, long TBO intervals characterize MTU engines, just as much as environmentally friendly operation.

### Keep going

Our commitment to mining customers extends beyond the sale of our engines and systems. Through MTU **ValueCare** we offer a full line of products and services designed to ensure maximum performance, uptime and value. And our global service network is available to provide expert support wherever you are.

Engines for Dump Trucks < 70 - 130 tn. sh.

# Everyday heroes tackle the toughest challenges.



## No job is too heavy

Heights at which the air is perceptibly thin. Shimmering heat by day, icy cold at night. Constantly swirling dust, moisture that penetrates everything, steep hillsides on which heavy loads need to be moved. The conditions that dump trucks with MTU engines brave on a daily basis are beyond doubt the toughest in the world.

In an environment that places the highest demands on technology, vehicles run around the clock with minimal downtime – continually at full capacity.

## Benchmark technology

The combination of a rugged engine enhanced by a proven fuel injection system, refined engine management and a practical arrangement of the air and exhaust system makes our dump-truck engines a benchmark for these extreme applications. The most important advantages are built in: high torque at low engine speeds yields tremendous engine power.

The robust, individually adapted technology of MTU engines assures the highest availability of these vehicles which play an integral role in working the mine. Furthermore long maintenance intervals, maintenance-friendly designs, and low specific fuel consumption values keep life cycle costs low.

Our comprehensive, worldwide service network ensures the highest reliability, availability and optimal maintenance.

Engines for Dump Trucks 150 – 500 tn. sh.

# Going the distance with the heavyweights.



### Ready for the challenge

Dump trucks are becoming bigger and faster. Nowadays, they have to transport payloads up to 500 short tons – an extreme challenge for the engines in these “heavy-weights.” But it is a task that our super heavy-duty diesels cope with convincingly every day. Their mountains of power make sure that the vehicles they drive can carry larger loads and handle steeper terrain than the competition. With the end result that they deliver higher productivity.

### Technology makes the difference

The fact that our engines remain comparatively “agile” throughout the entire performance map, despite their enormous power, is a tribute to the technological genius of our designers and developers. The same can be said of their advanced combustion technology: it makes our engines cheaper to operate, cleaner and quieter than most others. Three benefits that make a difference – economically and ecologically.

Engines for Excavators, Loaders and Dozers

# Carrying it all away.



## Non-stop performance

They move massive amounts of coal or ore containing valuable materials such as gold, copper, silver, platinum. And they transport almost unimaginable amounts of material to the places where it is processed or loaded on dump trucks. In short: Contemporary mining would not be possible without the tremendous power of wheel loaders, dozers and excavators.

The powerful machines driven by our engines work with top reliability – and high productivity. Power packs like our brawny Series 4000 can run at maximum power with practically no breaks. For loaders and dozers this means that they can work continuously at full power, and excavators can achieve the fastest load cycles – even with maximum loads. Despite continuous operation the running costs remain low.

## As tough as you are

MTU engines are known as some of the lowest-consumption engines in the world. Furthermore, maintenance is so uncomplicated that your vehicles are fully operational again in record time.

Robust, stable, and cost-effective: These are the attributes that make our engines your best choice. In a vehicle fleet that demands as much as it delivers. And in a competitive field as tough as the environment in which the vehicles work.

## Support to keep you going

To help ensure maximum performance and uptime, MTU specialists are ready to provide expert support wherever and whenever you need it.



Engines for Drilling Rigs and Drilling Equipment

# Because only the strongest prevail.

## Reliable groundwork

Drilling is necessary in every mine – it is a task that should not be underestimated. Regardless of whether you are searching for natural resources or drilling blast holes, we supply engines that allow your drilling equipment to work reliably at high power.

Machines that are subject to extreme burdens over long periods of operation must be able to provide extraordinary power. Our engines make that possible, reliably and without restrictions. With their power, long service lives and cost-effectiveness, they have set standards against which other high-performance diesels have to measure themselves.

## Strength and sensibility

Electronic engine management ensures that our engines, with all of their strength, are finely tuned to their tasks. It protects the engine, optimizes performance and simplifies diagnostics and maintenance. Strength and sensibility are combined into the ideal combination that asserts itself everywhere – even under the harshest conditions.





Photo: Sandvik



Photo: Sandvik

Engines for Underground Mining Machinery

# The harsher the environment, the stronger we are.

### One of the hardest jobs in the world

Underground mining is challenging for both people and machines. Massive drilling equipment is driven through rock while vehicles and machines with heavy loads move around the clock at high temperatures in dust and moisture. Our engines are ideal for these situations.

The excellent power-to-weight ratio is only one of many factors. Reliability, high availability, and the long service life of the engines are also crucial for effective operation. Maintenance-friendly engine designs keep unproductive downtime to a minimum, long TBO intervals and low fuel consumption keep the life cycle costs low – for maximum effectiveness.

Our engines meet the stringent safety criteria of underground mining without restriction.

### Power with responsibility

The emissions levels of our engines meet the especially important demands of underground mining. We are leaders in this aspect as well: Modern injection technologies and continually optimized combustion processes make our engines as environmentally friendly as possible. So they comply with EPA Tier 4 final/EU Stage IV emissions regulations.

### Worldwide support. Above and below ground.

The performance of your MTU engines and systems is crucial for your success and competitiveness. No matter where you operate, even underground, MTU specialists are available through our global service network to provide expert support.

MTU Diesel Engines

# Designed for the future. Built for your success.

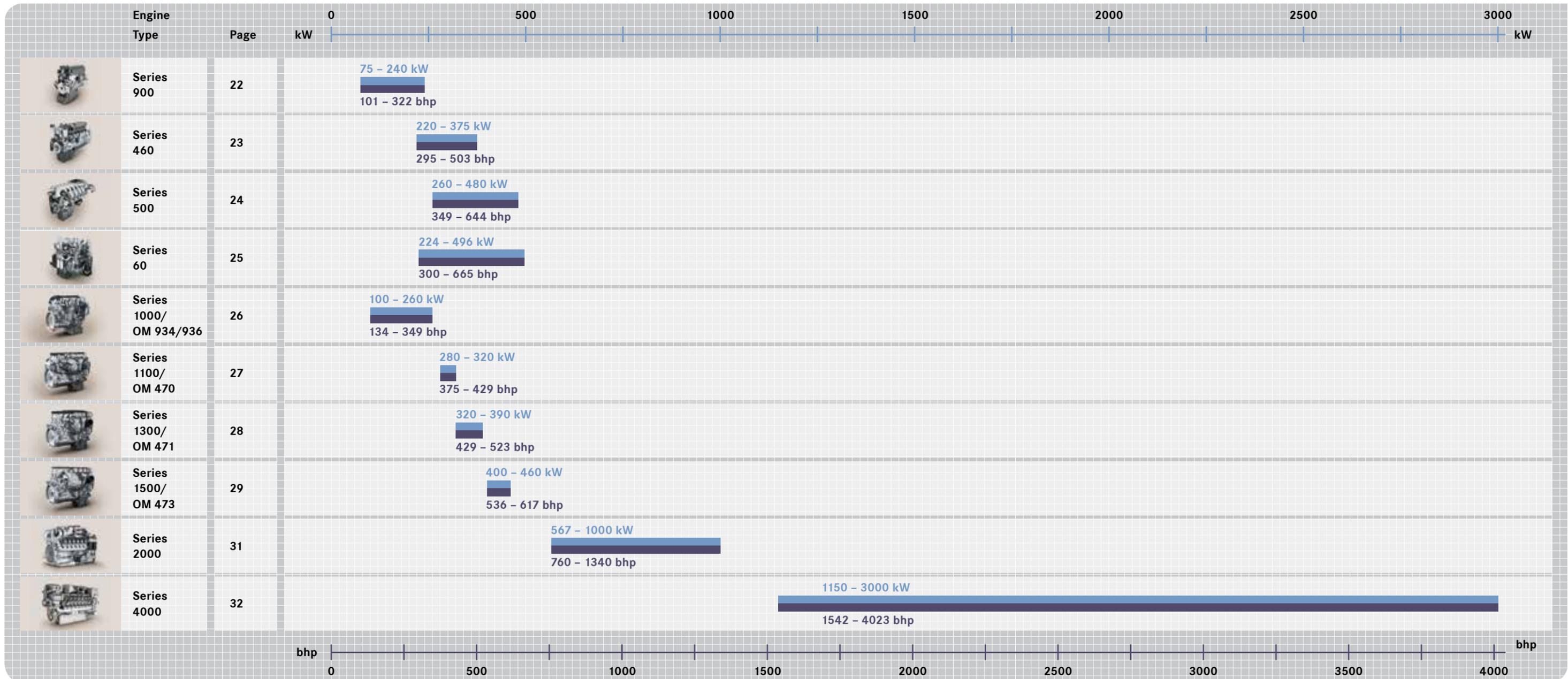
The higher the requirements and tougher the conditions, the more the need for an MTU engine. That's because we develop the optimum drive solutions for all individual tasks. The large range of MTU mining engines contains the right answer for every application – a solution including the highest performance, greatest reliability, safety, environmental friendliness and operating efficiency.

III



# All engines at a glance.

MTU is your global full-line partner offering solutions for all emissions requirements as well as the full power range from 75 to 3000 kW (101 to 4023 bhp). Our engines set the benchmark for what diesel engines must deliver in mining applications above and below ground. Their uncompromising operational availability ensures that mining operations run with absolute reliability, while their exceptional efficiency is a key factor in the economic success of mining operators.





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## Series 900

### For Underground Mining

Series	900			
Engine model	904 C01 4R	906 C01 6R	924 C01 4R	926 C01 6R
Power Output	kW 75 - 129 (101 - 173)	130 - 205 (174 - 275)	145 (194)	220 - 240 (295 - 322)
Peak Torque	Nm 400 - 675	675 - 1100	750	1200 - 1300
Speed	rpm 2200	2200	2200	2200
Emissions qualification	EU Nonroad St IIIA Comp (97/68/EC), EPA Nonroad T3 Comp (40CFR89), China NRMM Stage III (GB20981-2014)			

Series	900	
Engine model	904 C 4R	906 C 6R
Power Output	kW 75 - 130 (101 - 174)	150 - 205 (201 - 275)
Peak Torque	Nm 400 - 675	750 - 1100
Speed	rpm 2200	2200
Emissions qualification	MSHA	

Series	900 with SCR technology	
Engine model	924 C02 4R	926 C02 6R
Power Output	kW 95 - 150 (127 - 201)	175 - 240 (235 - 322)
Peak Torque	Nm 500 - 800	850 - 1300
Speed	rpm 2200	2200
Emissions qualification	EU Nonroad St IIIB Comp (97/68/EC), EPA Nonroad T4i Comp (40CFR1039)	

## Series 460

Series	460	
Engine model	460 C01 6R	
Power Output	kW 220 - 375 (295 - 503)	
Peak Torque	Nm 1300 - 2200	
Speed	rpm 1800	
Emissions qualification	EU Nonroad St IIIA Comp (97/68/EC), EPA Nonroad T3 Comp (40CFR89), China NRMM Stage III (GB20981-2014)	

Series	460 with SCR technology	
Engine model	460 C02 6R	
Power Output	kW 265 - 375 (355 - 503)	
Peak Torque	Nm 1750 - 2200	
Speed	rpm 1800	
Emissions qualification	EU Nonroad St IIIB Comp (97/68/EC), EPA Nonroad T4i Comp (40CFR1039), China Onroad Stage V (GB17691-2005)	



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## Series 500

Series	500		
Engine model	501 C01	502 C01	
	6V	8V	
Power Output	kW (bhp)	260 - 315 (349 - 422)	330 - 480 (442 - 644)
Peak Torque	Nm	1730 - 2000	2150 - 2800
Speed	rpm	1800	1800
Emissions qualification	EU Nonroad St IIIA Comp (97/68/EC), EPA Nonroad T3 Comp (40CFR89), China NRMM Stage III (GB20981-2014)		

Series	500 with SCR technology		
Engine model	501 C02	502 C02	
	6V	8V	
Power Output	kW (bhp)	265 - 350 (355 - 469)	375 - 480 (503 - 644)
Peak Torque	Nm	1850 - 2300	2400 - 3000
Speed	rpm	1800	1800
Emissions qualification	EU Nonroad St IIIB Comp (97/68/EC), EPA Nonroad T4i Comp (40CFR1039), China Onroad Stage V (GB17691-2005)		



## Series 60

Series	60		
Engine model	12.7 l	14 l	
Power output	kW (bhp)	224 - 373 (300 - 500)	336 - 496 (450 - 665)
Peak torque	Nm	1424 - 2237	2237 - 2576
Speed	rpm	2100 - 2300	
Emissions certification	EU Nonroad St II Comp (97/68/EC), EPA Nonroad T2 Comp (40CFR89)		

### For Underground Mining

Series	60		
Engine model	12.7 l	14 l	
Power Output	kW (bhp)	224 - 354 (300 - 475)	392 - 429 (525 - 575)
Peak Torque	Nm	1424 - 2102	2373
Speed	rpm	2100	
Emissions qualification	MSHA		

Series	60	
Engine model	14 l	
Power output	kW (bhp)	242 - 496 (325 - 665)
Peak torque	Nm	1559 - 2576
Speed	rpm	2000 - 2300
Emissions certification	EU Nonroad St IIIA Comp (97/68/EC), EPA Nonroad T3 Comp (40CFR89), China NRMM Stage III (GB20981-2014) upon request	



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## Series 1000/OM 934/936

Series	1000 with EGR and SCR technology		
Engine model	1000 C00		
	4R/OM 934	6R/OM 936	
Power Output	kW (bhp)	100 - 170 (134 - 228)	180 - 260 (241 - 349)
Peak Torque	Nm	600 - 900	1000 - 1400
Speed	rpm	2200	2200
Emissions qualification	EU Nonroad St IV (97/68/EC), EPA Nonroad T4 (40CFR1039)		



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## Series 1100/OM 470

Series	1100 with EGR and SCR technology	
Engine model	1100 C00	
	6R	
Power Output	kW (bhp)	280 - 320 (375 - 429)
Peak Torque	Nm	1900 - 2100
Speed	rpm	1700
Emissions qualification	EU Nonroad St IV (97/68/EC), EPA Nonroad T4 (40CFR1039)	



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## Series 1300/OM 471

Series	1300 with EGR and SCR technology	
Engine model	1300 C00 6R	
Power Output	kW (bhp)	320 - 390 (429 - 523)
Peak Torque	Nm	2100 - 2460
Speed	rpm	1700
Emissions qualification	EU Nonroad St IV (97/68/EC), EPA Nonroad T4 (40CFR1039)	



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## Series 1500/OM 473

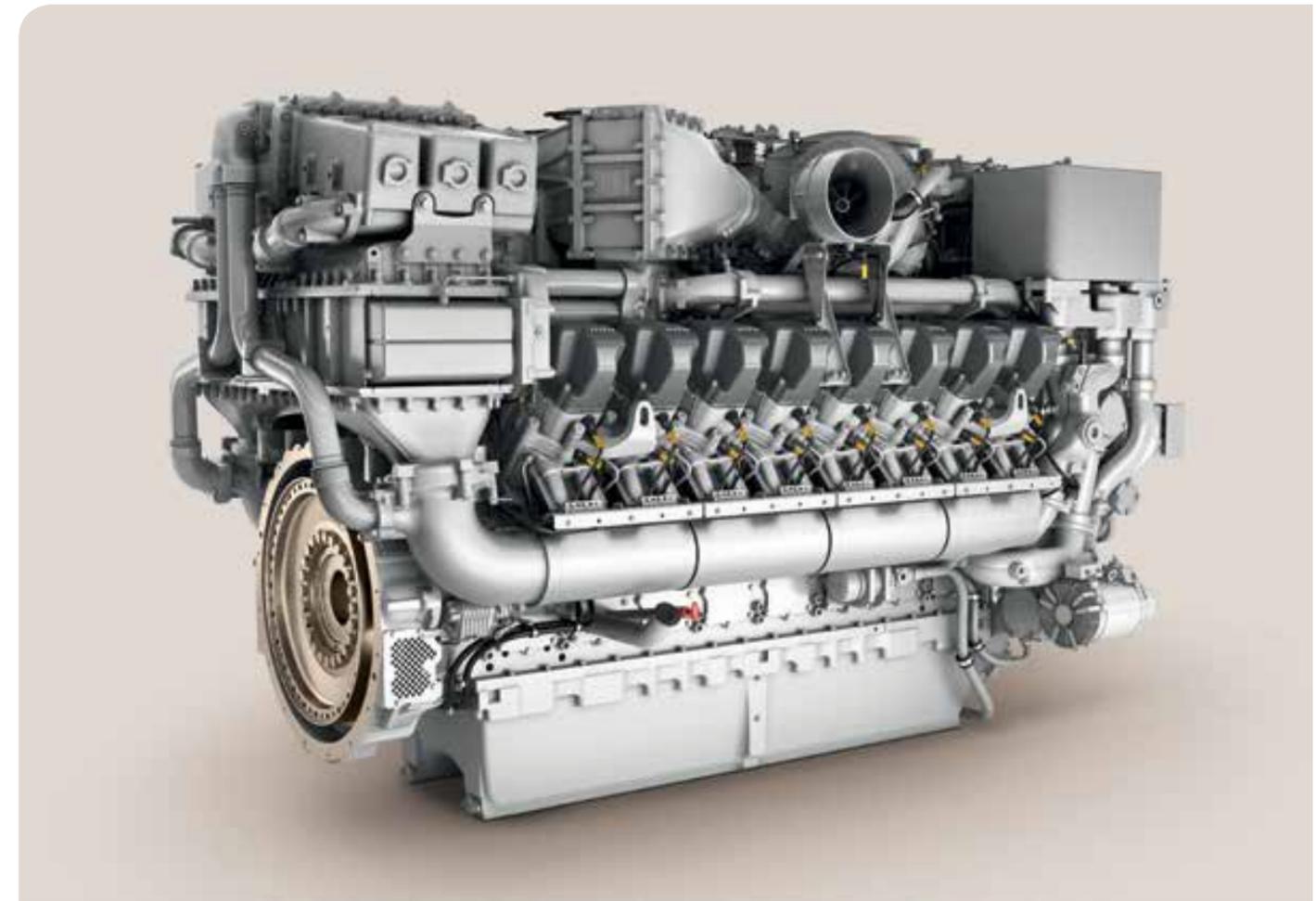
Series	1500 with EGR and SCR technology	
Engine model	1500 C00 6R	
Power Output	kW (bhp)	400 - 460 (536 - 617)
Peak Torque	Nm	2600 - 2900
Speed	rpm	1700
Emissions qualification	EU Nonroad St IV (97/68/EC), EPA Nonroad T4 (40CFR1039)	



## Series 2000

Series	2000		
Engine model	2000 C02		
	12V	16V	
Power Output	kW	567 - 750	783 - 1000
	(bhp)	(760 - 1005)	(1050 - 1341)
Peak Torque	Nm	3300 - 4100	4450 - 5250
Speed	rpm	2100	1800/2100
Emissions qualification	EPA Nonroad T2 Comp (40CFR89)		

Series	2000 with EGR technology		
Engine model	2000 C06		
	12V	16V	
Power Output	kW	783	970
	(bhp)	(1050)	(1301)
Peak Torque	Nm	4636	5286
Speed	rpm	1800/2100	2100
Emissions qualification	EPA Nonroad T4i Comp (40CFR1039)		



## Series 4000

Series	4000			
Engine model	4000 C01		4000 C02	
	12V	16V	20V	
Power Output	kW	1193 - 1510	1492 - 2125	2720
	(bhp)	(1600 - 2025)	(2000 - 2850)	(3650)
Peak Torque	Nm	6985 - 8199	9313 - 11142	15159
Speed	rpm	1900	1800/1900	1800
Emissions qualification	Fuel consumption optimized, EPA Nonroad T1 Comp (40CFR89)			

Series	4000 with EGR technology			
Engine model	4000 C05			
	12V	16V	20V*	
Power Output	kW	1150 - 1864	2000 - 2400	2800 - 3000
	(bhp)	(1542 - 2500)	(2682 - 3218)	(3755 - 4023)
Peak Torque	Nm	7351 - 10409	10581 - 13403	15363 - 16753
Speed	rpm	1800/1900	1800/1900	1800
Emissions qualification	EPA Nonroad T4 (40CFR1039)			

\* upon request

Series	4000			
Engine model	4000 C03			
	12V	16V	20V	
Power Output	kW	1193 - 1680	1492 - 2240	2375 - 3000
	(bhp)	(1600 - 2253)	(2000 - 3000)	(3185 - 4023)
Peak Torque	Nm	7595 - 9435	9520 - 12566	15120 - 16852
Speed	rpm	1800/1900	1800/1900	1800
Emissions qualification	Fuel consumption optimized, EPA Nonroad T2 Comp (40CFR89), China NRMM Stage III (GB20981-2014) upon request			

# Low emissions. High performance.

MTU has long established itself as a leader in the development of solutions for emissions reduction. This challenge involves key technologies which we carry out in-house.

In mining the aim is to collect natural resources while generating profit. One basic condition for efficient operations is to comply with emissions regulations. We care for the technology you need.

In order to achieve advanced emissions reductions, we have invested our comprehensive expertise in core technologies: common-rail-fuel-injection, turbocharging, cooled exhaust gas recirculation, electronic engine controls for optimizing engine processes and preventing soot formation, as well as external optimization.

Advanced emissions regulations like EU Stage IV/EPA Tier 4 final demand further significant reduction in the pollutants emitted. Our engines and systems meet current legislative requirements with proven technologies.

We care for the optimal solution for the special demands of each application and power range by choosing the ideal technology.

## Aftertreatment technology below 560 kW (750 bhp)

Beside our emissions reduction technologies like EGR, common-rail-fuel-injection and charge-air-cooling our engines below 560 kW (750 bhp) are equipped with SCR aftertreatment technology.

### Advantages

The advantages of SCR in our engines:

- Low fuel consumption
- Uncompromising engine availability and operational safety
- Substantial reduction in nitrogen oxide and greenhouse gas emissions
- No DPF and no DOC required

The perfect interplay of different technologies facilitates optimal results and the most important aim is achieved – a decrease in harmful emissions, along with a reduction in fuel consumption. A win-win situation for your earnings and the environment.

## No aftertreatment above 560 kW (750 bhp)

Our engines above 560 kW (750 bhp) don't use any exhaust aftertreatment technology. Instead our latest engines are equipped with state of the art EGR technology combined with our core technologies. In combination those technologies enable engine compliance with the most stringent emission regulations such as EPA Tier 4 final. That means optimum engine characteristics and cost-efficient operation while meeting emissions standards.

Depending on the engine operating point, a certain quantity of exhaust gas is conveyed to the EGR cooler. As it passes through the cooler, the hot exhaust gas is cooled and then mixed with charge air. Mixing the exhaust gas with charge air results in a significant reduction in combustion temperature by comparison with engines that are not using EGR. In return, much lower raw emissions levels of nitrogen oxide are generated inside the engine. The highly efficient EGR combustion process developed by MTU ensures compliance with EPA Tier 4 final emissions legislation without the need for aftertreatment.

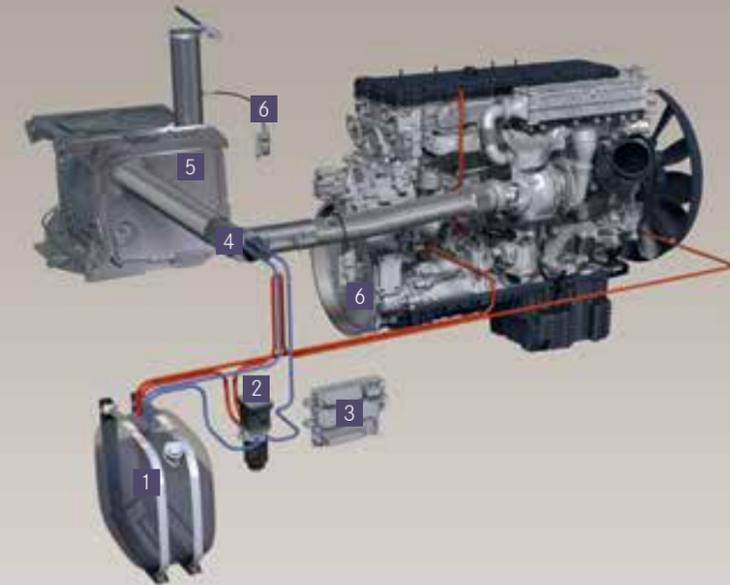
### Advantages

The combination of MTU core technologies like EGR offers many advantages:

- Low fuel consumption
- Wide engine performance map – full torque curve
- Exceptionally high torque at low speeds
- Excellent transient behaviour (load acceptance/speed jumps)
- Full power output available even at high altitudes
- Full power output available even at high ambient temperatures

No need for exhaust aftertreatment also means no need for additional operating fluids such as DEF, nor for DPF or DOC, nor for hydrocarbon dosing.

## Aftertreatment Technology below 560 kW (750 bhp)



Aftertreatment Technology below 560 kW (750 bhp) – example Series 1300 EU Stage IV/EPA Tier 4 final

- 1 Urea tank**  
with urea fluid
- 2 DEF urea supply unit (pump)**  
pumps liquid urea from the tank to the dosing unit
- 3 Aftertreatment Control Module (ACM)**  
controls and regulates functions of the aftertreatment system
- 4 Dosing unit with urea nozzle**  
prepares correct urea quantity in relation to untreated engine emissions and provides for optimal spraying of urea/air mixture into exhaust line
- 5 SCR-catalyst**  
converts nitrogen oxides in exhaust gas into harmless air components
- 6 NOx-sensors**  
measure respective engine emissions in exhaust system

We will be available as a partner to help design your optimal SCR system.

EGR Technology (example Series 1500 EPA Tier 4 final)

- 1 Turbocharging**  
assures low fuel consumption across wide speed range, exceptionally high torque at low speeds, and clean combustion
- 2 EGR coolers**  
bring about a lowering of the combustion temperature (and subsequently of nitrogen oxides generated in-engine) and are integrated into the high-temperature cooling circuit so that less heat is introduced, which in turn permits lower cooler dimensions
- 3 EGR rate**  
EGR valve regulates recirculated exhaust gas quantities. EGR rate is optimized for all operating modes

## EGR Technology





## MTU Repowering Solutions

# More Profit. More Power. More Productivity.

### A proven solution

MTU stands alone as the premier engine supplier to many of the world's most productive mine operations. Engineered and built specifically for mining, the Series 4000 is widely regarded as the industry's ideal engine for high-horsepower applications, due to its superior durability, fuel economy and low total cost of ownership. More than 800 mining vehicles have already been repowered with Series 4000.

Series 4000 engines provide up to 6% better fuel economy and up to 3% higher availability than the engines they have replaced. It is therefore no surprise that the Series 4000 engines have been installed in most truck models in place of all non-captive brands.

Many equipment operators have saved enough in fuel, maintenance and repair costs to return their repower investment before the first overhaul. Installation detail and cost saving projections are available from any authorized MTU distributor.

Pre-engineered repower kits are available for the most popular mining equipment models. The efficiency of MTU's repower process results in typical equipment outage of one week or less.

### Much more than a new engine

We produce system designs and provide complete individual solutions for every possible requirement and any application.

The heart of the system is always the engine as the main component of a mining-vehicle powertrain. It is supplemented by a wide range of auxiliary equipment that can be adapted to suit the basic engine in every particular and which of course is manufactured to the same high quality standards.

### The auxiliary systems include:

- Electronic engine management: for safety, reliability, versatility and data recording
- Transmission/generator: the complete solution – from a single source
- Baseframe: for secure and permanent attachment/support of system components
- Acoustic enclosure/exhaust silencers: for consistently low noise emissions
- Cooling system: modern systems with intelligent management
- Mountings: for maximum safety and comfort

To keep the system easy to manage despite its technological complexity, the number of interfaces between the engine and peripheral systems is deliberately limited. The entire powertrain module can be quickly installed and commissioned using Plug&Play connections. This is an advantage for repowering projects and particularly when replacing engines. Availability and economy are substantially improved, thus downtimes are minimized.

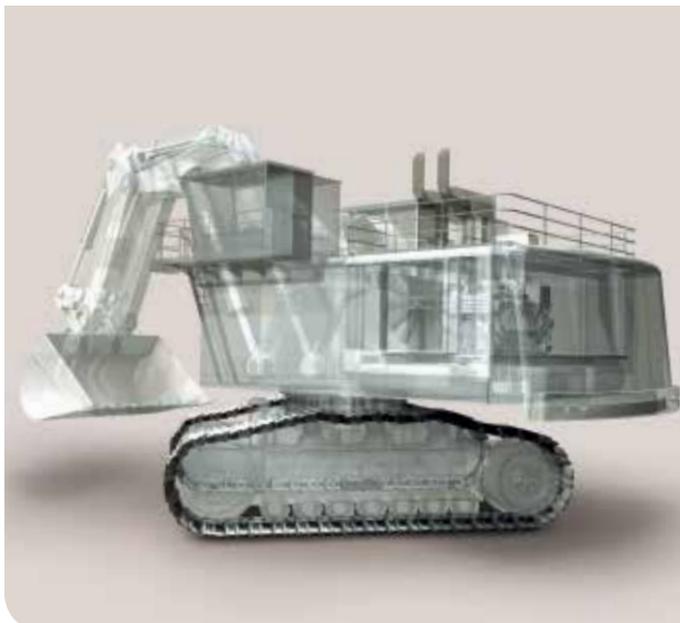
### A powerful advantage

- Higher reliability: increased uptime achieved through improved engine reliability and ease of maintenance due to simplicity of engine configuration
- Higher availability: robust engine is time proven in mining
- Enhance operator productivity: lower engine noise level reduces operator fatigue
- Lowest total cost of ownership:
  - Best fuel efficiency in the industry
  - Increased time between overhaul (TBO) & highly consistent overhaul intervals
  - Multiple rebuilds of original engine core throughout the engine life
  - Lower operation costs
- Emission and application specific engines:
  - High altitude specification engines
  - Emission qualified
  - Fuel consumption optimized

We can help manage your projects right from the initial planning. We provide helpful, expert advice from the concept phase to production use. In this way, you benefit from our experience very early on and develop a drive design that is just right for your specific equipment and application.

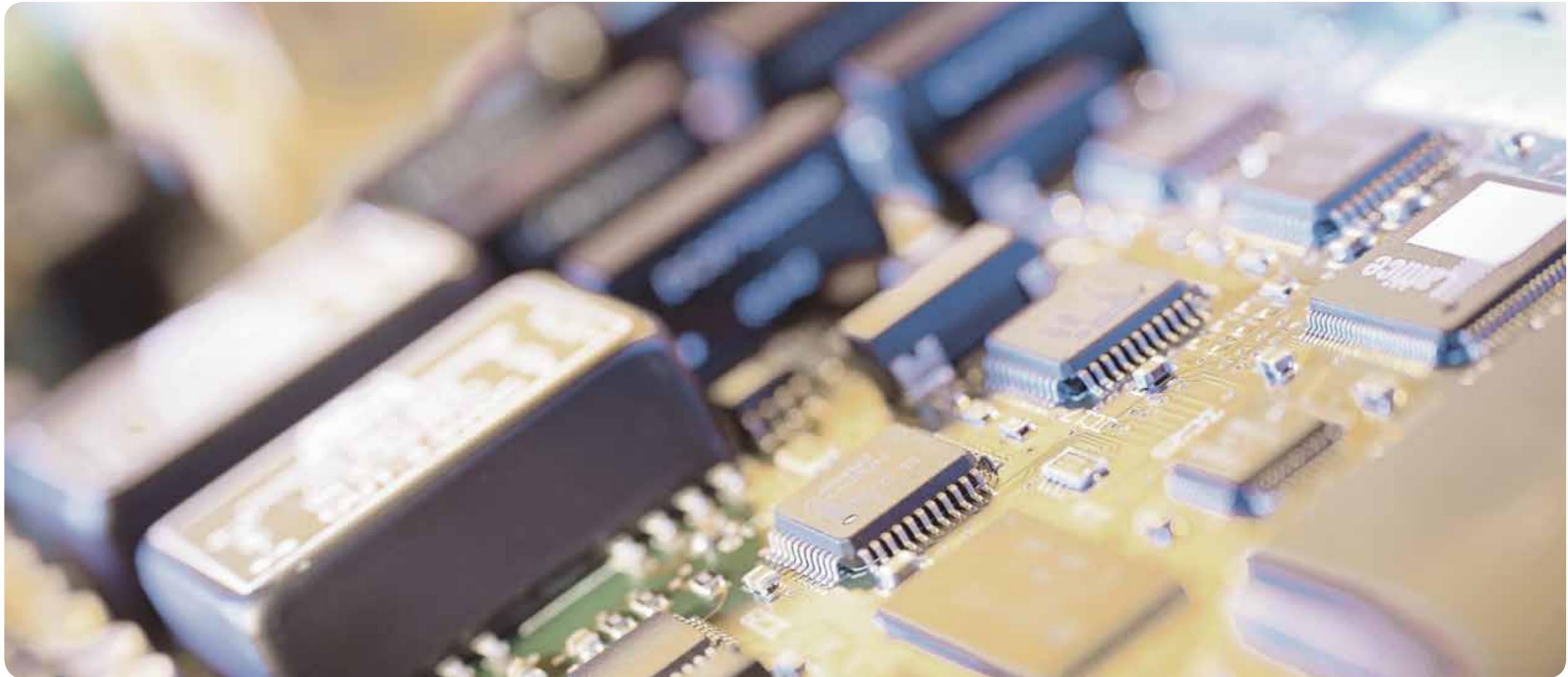
### Time is money

Due to intelligent engineering and efficient processes we repower you quickly. The duration for the complete engine replacement up to final testing will be approximately one week only.



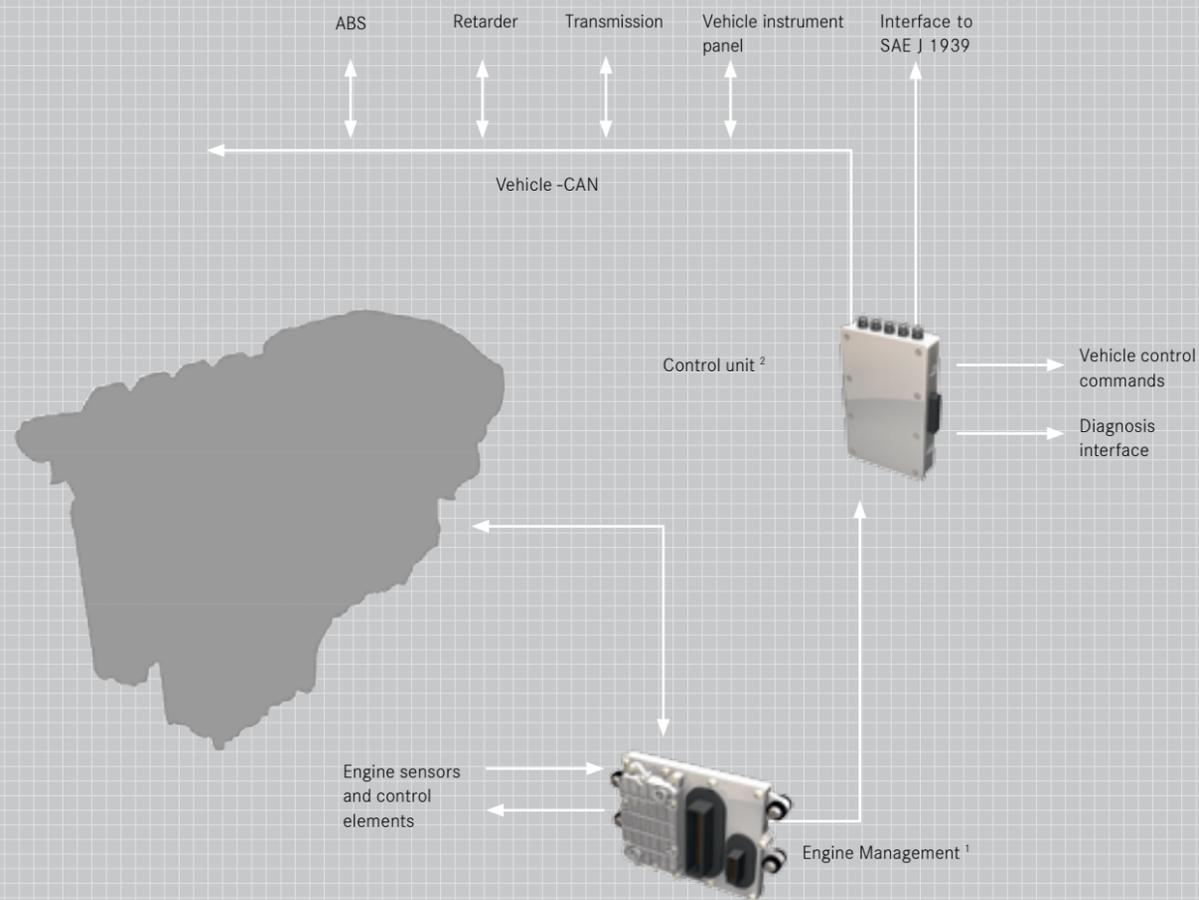
# Controlling the power with intelligent electronics.

Our engines are powerful and technologically advanced. But in order to offer the best efficiency, reliability, safety and environmental friendliness, they need more than just power – they need intelligent electronic management. Modern engine management systems handle the control and monitoring of the hardware and enable perfection of performance. The combination of power and precision.



**Scope of supply for current engine series  
with emissions regulations EU Stage III A/EPA Tier 3**

Engine management system  
- Typical configuration Series 460, 500, 900 -



**Additional components for current engine series  
with emissions regulations EU Stage III B/EPA Tier 4i**

Engine management system with integrated SCR system  
- Typical configuration -



<sup>1</sup> Engine mounted  
<sup>2</sup> Vehicle mounted

Engine Management Systems for Series 460, Series 500 and Series 900

# We manage everything for you.

All our engines are equipped with electronic engine controls. Intelligent electronics ensure that performance and efficient operation are achieved under all operating conditions. Innovative, high-end technology takes over the control, regulation and monitoring of the drive system. The systems are modular in order to be able to adapt the diesel engine to the complex optimal operating conditions of the equipment. In addition, operating conditions that could lead to damage are detected in time.

For engines equipped with SCR systems, we are your expert technology partner. The latest electronics integrate the necessary SCR components for the reduction of emissions intelligently into the overall system. This ensures optimal tuning of all engine and emission control functions.

**Your benefits:**

- Protection of the engine and therefore safety by:
  - Reporting critical operating conditions
  - Temporary reduction in power
  - Automatic shutdown
  - Start inhibitor
  - Over speed regulation
  - Self-diagnosis and regulation for the system
- Standard interfaces for external system connections, such as CAN data bus and SAE J 1939
  - Easy integration with the vehicle
  - Flexible adjustment to the vehicle or vehicle components and project specific needs
  - Interface for engine diagnosis
- High availability and fail-safe operation
- High power efficiency
- Low fuel consumption
- Minimal exhaust emissions that fully meet all legal requirements

# The management technology for mining applications with Series 4000.

The **motivline** automation system is an innovative highend technology developed by MTU for mining vehicles. **motivline** performs the control and monitoring functions for the entire engine plant. The modular system guarantees optimum adaptation of the diesel engine to the diversity of operating conditions in mining.

**motivline** supports:

- flexible adaptation to the vehicle and/or its components and project-specific requirements
- automatic power output adjustment or optional engine shutdown by the integrated safety system and all other necessary monitoring and safety functions
- Interface – MTU telemetric device for GSM\* – for MTU **ValueCare** product Remote Services (optional with user agreement), which provides direct access to the data of your MTU engine
- Easy adaptation by means of MTU interface module **SAM**

**motivline** harmonizes the engine integration into the vehicle. Because of that optimized conditions generates:

- **high power-efficiency**
- **low fuel consumption**
- **minimal exhaust emissions that are substantially below the legal limits**

For the **Series 4000 engines**, a new engine management system **ADEC** has been developed, whilst there is also an extensive range of standardized solutions available – with options for flexible interfaces. The Engine Monitoring Unit **EMU** provides further enhanced availability by means of additional monitoring and diagnostic options for the engine. Complementing the **SAM** interface module, **POM** optimizes the start process and simplifies cabling to the starter and alternator. The complete **Plug&Play** system makes installation of the engine in the vehicle considerably simpler and faster.

\* Global System for Mobile Communications

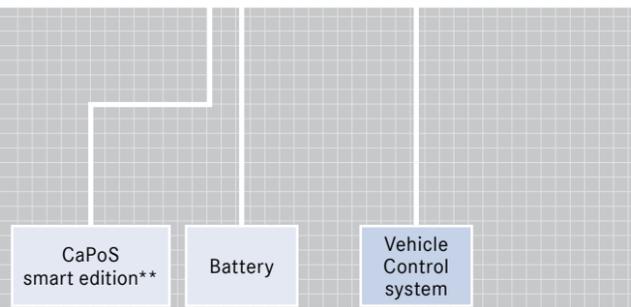
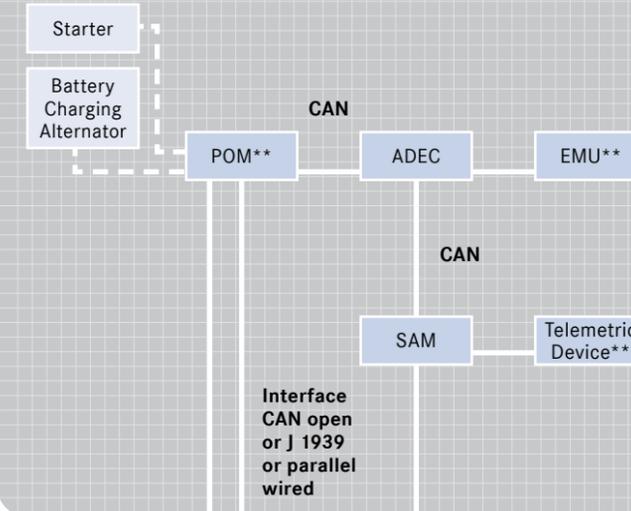
**System highlights and benefits:**

- Complete system supplied from a single source
- Modular design
- Minimal wiring on engine
- Improved diagnostic functions
- Intelligent bus technology
- Plug&Play equipment

**That means:**

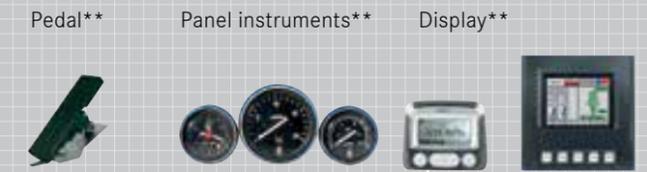
- Low costs for logistics and training
- Low risk
- Rapid project processing and short fitting times
- Trouble free integration

- ADEC** = Advanced Diesel Engine Control
- EMU\*\*** = Engine Monitoring Unit
- POM\*\*** = Power Output Module
- SAM** = Service and Application Module
- CaPoS** = Capacitor Power System

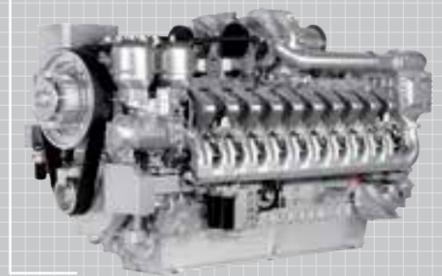
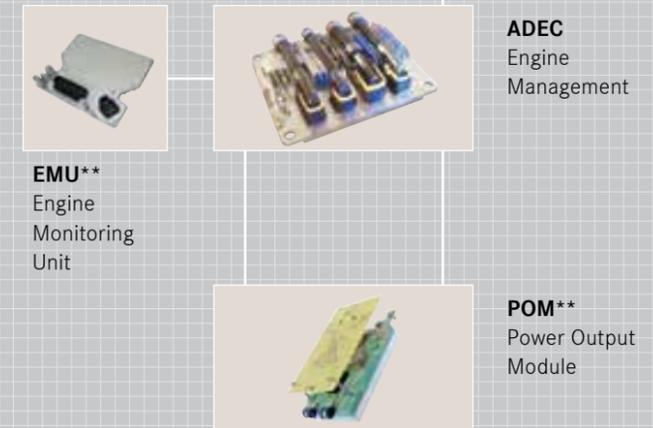


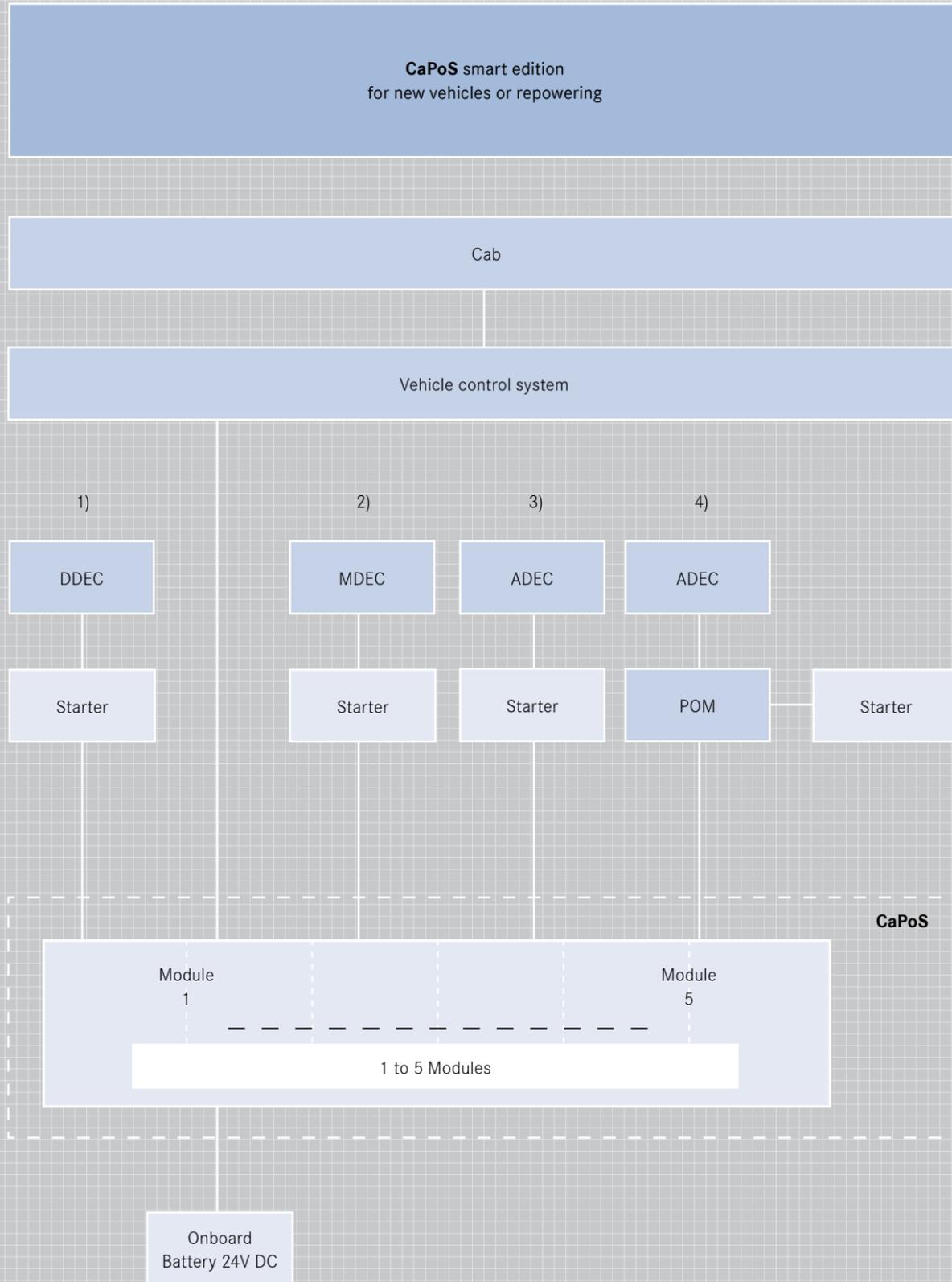
\*\* Optional

**Cab control desk with monitoring and control system**



**Engine with control systems**





- 1) Series 4000 01, Series 2000 02
- 2) Series 4000 02
- 3) Series 4000 03/05, Series 2000 06
- 4) Optional for Series 4000 03, Series 2000 06



## CaPoS smart edition – Capacitor Power System for Series 2000, 4000

# Reliable power right from the start.

CaPoS smart edition was especially developed for heavy duty applications and provides the high energy required by the 24V DC starters during the starting sequence.

CaPoS smart edition uses capacitor technology to optimize startup behavior. The number of modules to be used depends on the type of engine involved and its breakaway torque. CaPoS smart edition may be used autonomously or in conjunction with the **motivline** automation system.

**The most important features at a glance:**

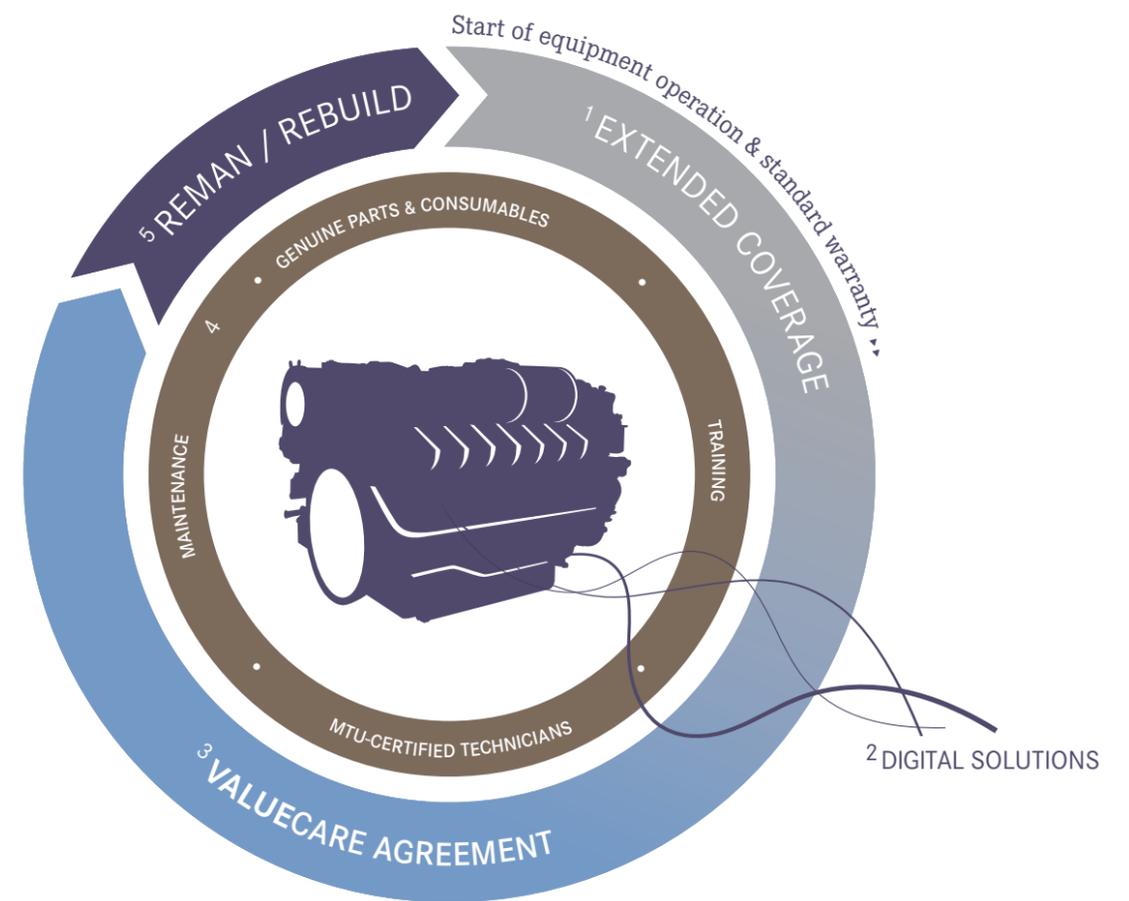
- Autonomous and modular construction
- Maintenance-free system
- Significant reductions in weight and volume compared with conventional starter batteries
- Optimized cold-starting capabilities
- Low life-cycle costs
- No voltage interruption during start-up
- Onboard voltage of 24V DC
- Integrated self-monitoring system with interface to vehicle control system
- Integrated DC-/DC converter for automatical recharging
- IP66 protection and ambient temperature optimized from -40°C to +60°C (-40°F to +140°F)



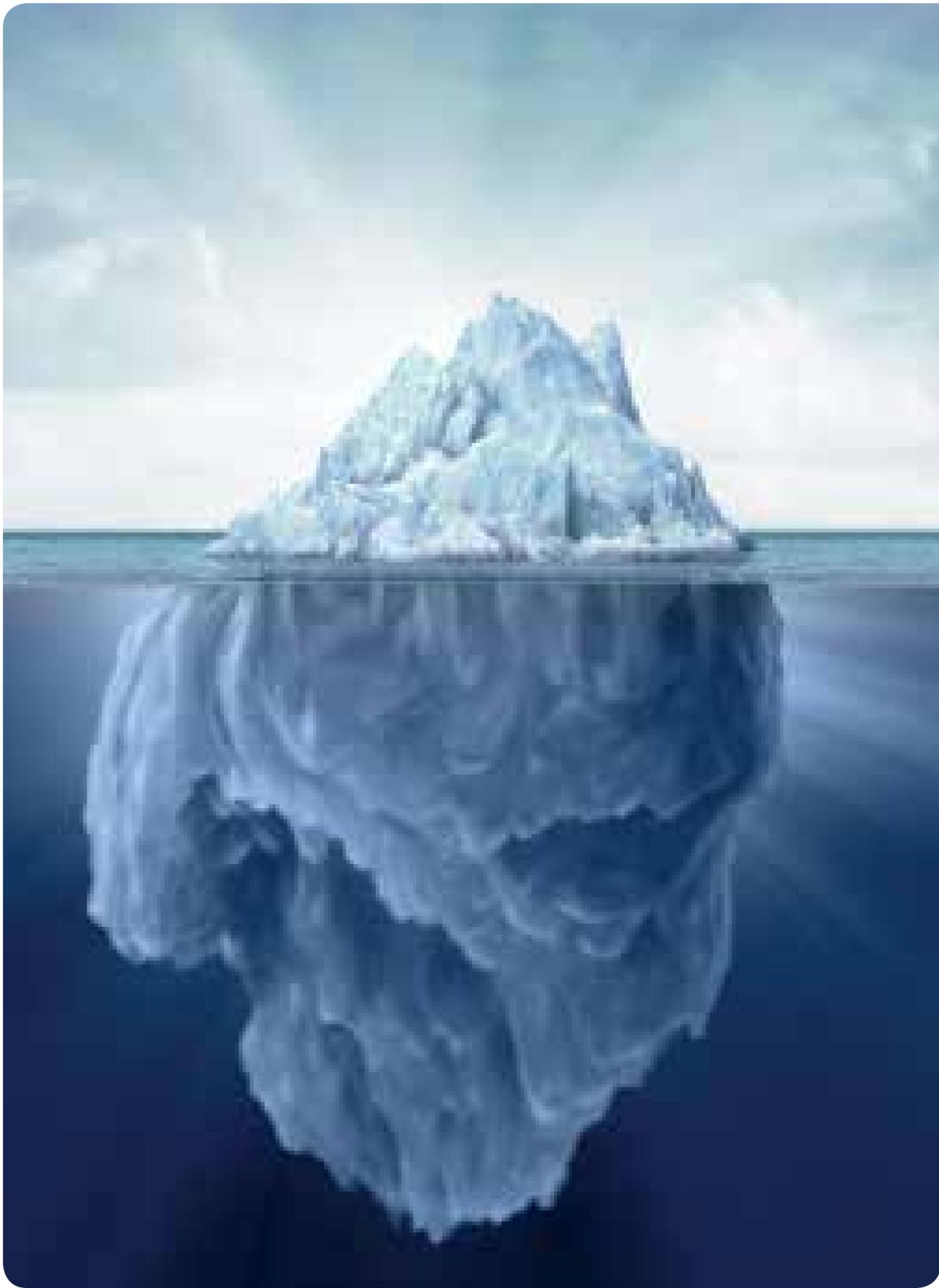
MTU **ValueCare**

# Ensure a long, reliable life.

As your equipment ages, its needs—and yours—change. MTU **ValueCare** wraps around your MTU investment, providing 360 degrees of customized support, for optimal value at every stage of life.



1. Avoid the unexpected with added protection beyond the standard warranty.
2. Make better decisions faster with data-enhanced tools.
3. Maximize availability and optimize lifecycle costs with an individually tailored Long-term Service Agreement.
4. Improve system performance and extend equipment life with on-demand support from MTU.
5. Keep a good thing going with MTU reman/rebuild solutions.



## Preventive Maintenance

# Look beneath the surface for lasting value.

Upfront costs are only a small part of your engine investment. Long-term value can only be realized by considering the big picture. We've found that preventive maintenance yields tremendous savings in cost and time throughout the life of your equipment. There's simply no better way to optimize fuel economy, maximize uptime and avoid the unexpected.

### Optimize fuel economy.

Fuel consumption accounts for up to 90 percent of total lifecycle costs depending on the application—by far one of the most significant costs associated with your equipment. Well-maintained MTU engines deliver industry-leading fuel efficiency, helping you keep fuel costs down over the long term.

### Maximize uptime.

Preventive maintenance services can be planned around your schedule, so your equipment is available when you need it most.

### Avoid the unexpected.

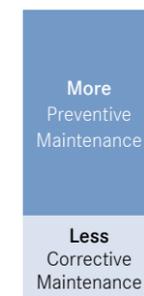
Planned maintenance helps solve problems before they start, helping you avoid unexpected downtime and resolve problems early before they escalate.

### Work with one source.

MTU keeps maintenance simple, safe and efficient. Our factory-approved methods and expert technicians ensure everything is done correctly according to proprietary MTU preventive maintenance schedules, optimizing the availability of your equipment, reducing lifecycle costs and helping you avoid unforeseen problems.

## The Importance of Preventive Maintenance

When preventive maintenance is a high priority.



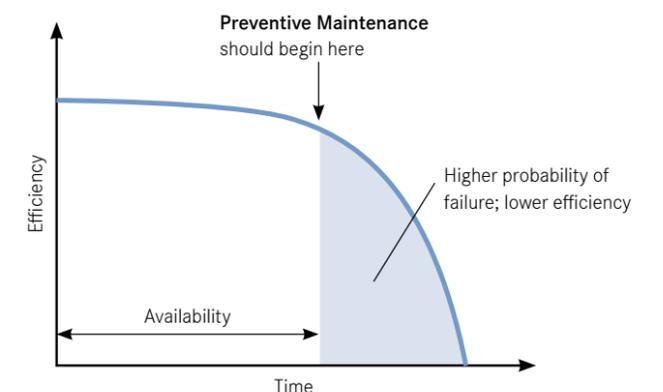
1. Scheduled stops
2. Improved performance
3. Better control over operation

When preventive maintenance is a low priority.



1. Nonscheduled stops
2. Inability to plan
3. Lower performance

MTU focuses on preventive maintenance to reduce the downtime and added costs of corrective maintenance.



Delaying maintenance increases unexpected failures and decreases performance and fuel economy.

MTU-certified support

# Rely on MTU expertise.

To give your equipment a long and productive life, choose a partner you can trust. Only MTU-certified technicians know how to get the job done right using proven service methods, MTU-specified maintenance schedules and genuine OEM parts.

From preventive maintenance to complete rebuild, MTU is your true lifecycle partner. Whatever level of support you need, our global network of factory-trained professionals knows all about your equipment and is ready to prepare a customized plan to help you maximize performance and minimize life-cycle-costs.

#### Never compromise.

MTU engines and systems are built to last with legendary high standards. When it's time for service, don't settle for anything less. To get the most from your equipment, there are no shortcuts. For maximum reliability, performance and uptime, choose a name you can trust—MTU.

#### Learn from the best.

Training is a great way to become proficient with MTU engines and systems and get maximum efficiency from your equipment. From preventive maintenance to diagnostics and repair, our training programs provide a hands-on learning experience with knowledgeable, expert trainers. We offer a wide range of customized training programs around the world to maximize your return on investment.

#### If you need us a little:

*On-Demand Support*—including professional inspections and preventive maintenance recommendations from MTU – helps you identify and address problems early, save on repairs or unexpected downtime, and optimize your equipment's performance and longevity. Inspections include visual assessment, test run and leak check, on-site oil and coolant analysis, diagnostic evaluation and reporting.

#### If you need us a lot:

*Long-term Service Agreements* for mining applications make it easy to plan the cost of maintenance and maximize availability throughout your MTU equipment's lifecycle. The details, terms and periods of each package are precisely tailored to match your individual needs, with maintenance performed by MTU-certified technicians using only genuine new or remanufactured parts.



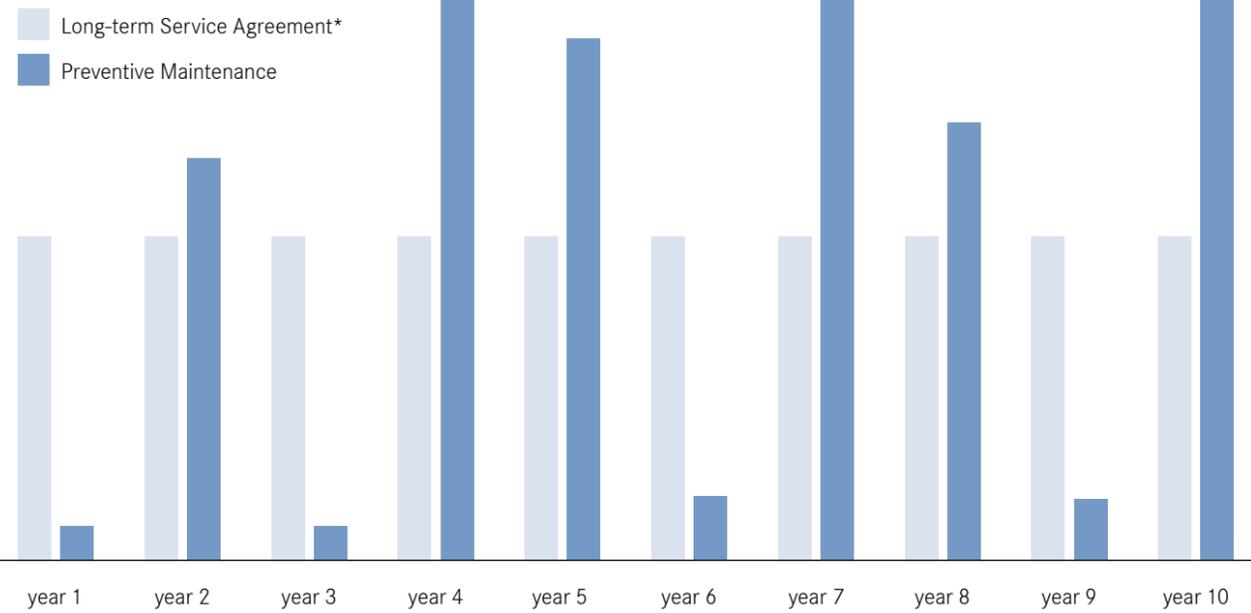
# Plan ahead.

The annual cost of maintenance can vary dramatically depending on how and where your equipment is used. At mine sites where optimal equipment availability and performance are essential, and predictable costs are preferred, we can help.

**Optimize availability.**

Long-term Service Agreements from MTU make it easy to plan the cost of maintenance and maximize availability throughout the lifecycle of your MTU equipment. The details, terms and periods of each agreement are precisely tailored to match your individual needs, with maintenance performed by MTU-certified technicians using only genuine new or remanufactured parts.

## Example: Scheduled Maintenance Costs



**Financial Investment**

Annual costs are more predictable and consistent with Long-term Service Agreements.

\* Excludes corrective services

# Protect your investment.

MTU mining engines—backed by Extended Coverage—provide invaluable peace of mind beyond the standard warranty. With Extended Coverage, you can be assured that the costs of unplanned repairs are covered, with service performed by MTU-certified technicians—upholding resale value and ensuring long-term confidence in your MTU investment.

**Cover the unexpected.**

Extended Coverage protects you from the cost of unexpected repairs beyond your standard warranty, with professional service from MTU-certified technicians and coverage tailored to your needs. Packages can also be extended up to five years and are fully transferable, enhancing resale value. Coverage includes all materials and labor for troubleshooting, fault clearance, and corrective services to engines and on-engine electronics (excluding gearbox, alternators or similar components). To ensure maximum quality, all repairs are conducted using only genuine MTU parts.



# Make better decisions – faster.

Digitization is more than a buzzword – good data fuels smarter decisions. Available for mining applications, Data-enhanced Solutions from MTU harness that power, giving you vital information and helpful tools to simplify and streamline MTU equipment ownership, operation and maintenance.

**Monitor activity from afar.**

Identify faults early and make informed decisions quickly – even thousands of miles from the work site – by accessing vital engine and system information online with Remote Services.

**Be proactive.**

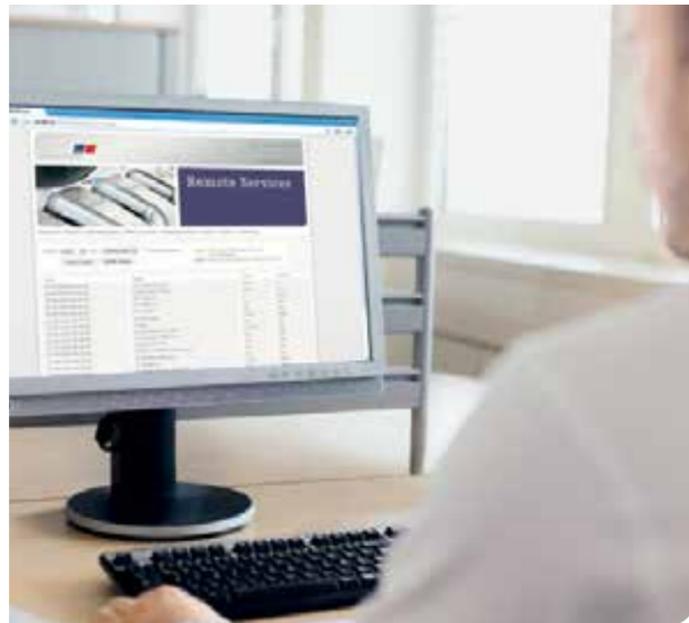
Remote Services can improve your engine's performance, and your profitability, by helping you avoid downtime. Using a telemetric device, important data such as fluid pressures and temperatures, alarms, current location and hours of duty is recorded and transmitted in near real-time or at predetermined intervals.

Through early fault identification and a configurable eCall, you can act decisively and proactively to increase engine efficiency, prevent damage, reduce downtime, identify necessary replacement parts, and save on service and repairs. All you need is a computer with an Internet connection.

**Get everything you need.**

- MTU supplies the complete package:
- Telemetric device
  - Connection cable and antenna
  - SIM card for data transmission via the mobile phone network
  - Installation documentation
  - Web-based operating instructions
  - Storage capability on an MTU remote server

An onboard telemetric device transmits vital equipment data, accessible in near real-time on your computer screen.



# Exchange and save.

Factory remanufactured MTU products deliver the same high standards of performance, service life and quality as new MTU products, along with identical warranty coverage – at a fraction of the cost. And with design and model-related updates, they also feature similar technological advancements. Developed by R&D engineers, the remanufacturing process saves you time and money, while benefiting the environment through the reuse of materials. To help you work efficiently, a wide range of remanufactured parts, engines and systems are available worldwide.

**Reduce lifecycle costs.**

As you evaluate your long-term power needs, you must consider a variety of factors. Factory remanufactured products are a smart solution, helping you reduce the total lifecycle cost of your equipment.

**Save time.**

Factory remanufactured products put your equipment back to work faster than an overhaul, which reduces downtime, service time and indirect costs such as storage.

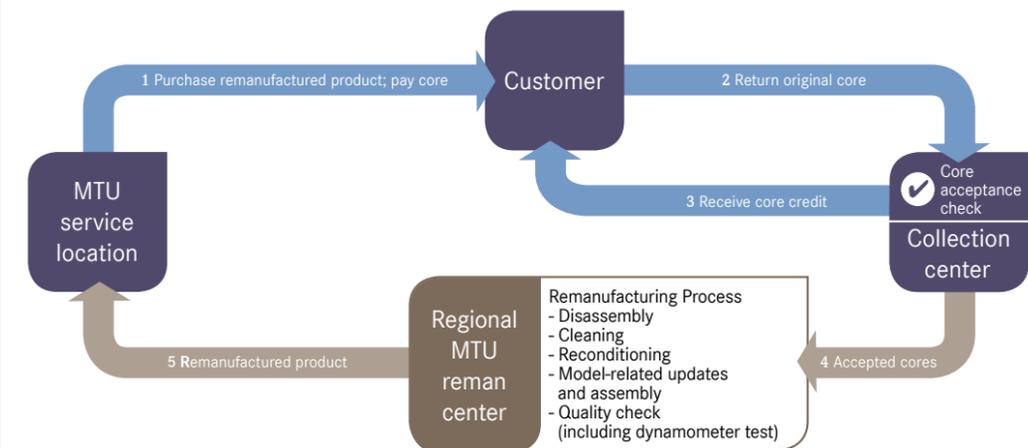
**Maintain MTU standards.**

All products are remanufactured to strict MTU standards by MTU-certified technicians at regional MTU reman centers. Only MTU can remanufacture MTU parts, engines or systems to original MTU factory specifications.

**Protect the environment.**

Since remanufacturing is an efficient use of resources and energy, factory remanufactured products benefit the environment as well.

## Exchange Process



- 1 Customer purchases remanufactured product from local MTU service partner and pays the core deposit.
- 2 Customer's original core is returned to collection center by local MTU service partner for core acceptance check.
- 3 Customer receives core credit based on the core's technical condition.
- 4 Accepted cores are sent to regional MTU reman centers, where the remanufacturing process takes place.
- 5 Remanufactured products are delivered to MTU service partners and made available for purchase.

# Local support. Worldwide.

Whenever and wherever you need expert support, MTU specialists are available. Our global service network of more than 1,200 locations – backed by our cutting-edge Parts Logistics Centers – provides you this assurance. To find your local MTU distributor, visit [www.mtu-online.com](http://www.mtu-online.com).

#### Customer Assistance Center

Agents are available 24/7 for fast response to your inquiries and any service needs.

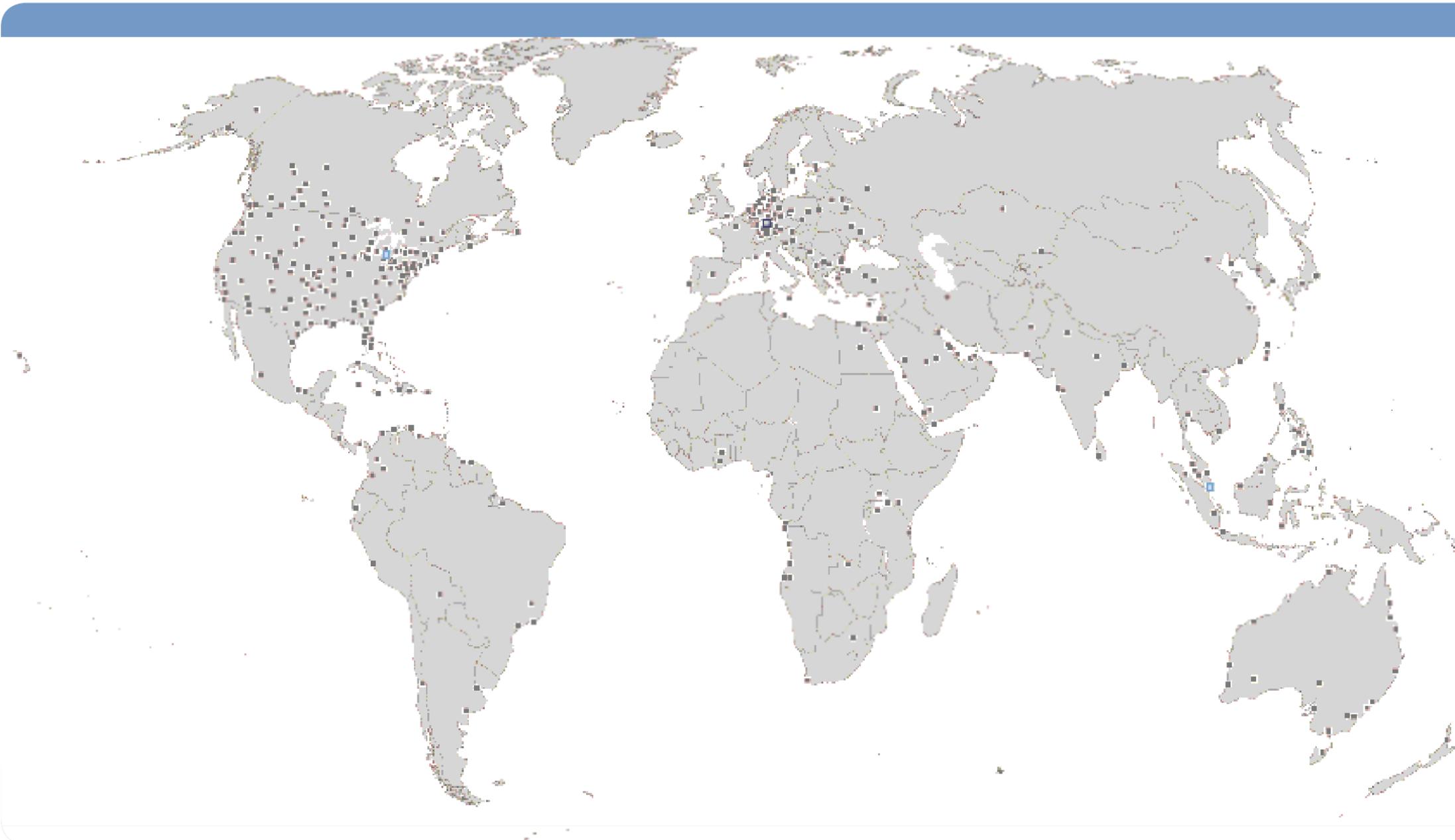
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Asia/Pacific +65 6860 9669

North and Latin America +1 248 560 8888

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VII



#### Local support. Worldwide.

We ensure that you receive individualized support from our global network of more than 1,200 service centers—anywhere, anytime.

- Global Headquarters
- Regional Headquarters
- Sales and Customer Service Center

# Series and Emissions Qualification.



Engine model	EU Nonroad St II Comp (97/68/EC)	EU Nonroad St IIIA Comp (97/68/EC)	EU Nonroad St IIIB Comp (97/68/EC)	MSHA	EPA Nonroad T2 Comp (40CFR89)	EPA Nonroad T3 Comp (40CFR89)	EPA Nonroad T4i Comp (40CFR1039)	China NRMM Stage III (GB20981-2014)	China Onroad Stage V (GB17691-2005)
<b>Series 900</b>									
4R 904 C01		■		■		■		■	
6R 906 C01		■		■		■		■	
4R 924 C01		■				■		■	
6R 926 C01		■				■		■	
4R 924 C02			■				■		
6R 926 C02			■				■		
<b>Series 460</b>									
6R 460 C01		■				■		■	
6R 460 C02			■				■		■
<b>Series 500</b>									
6V 501 C01		■				■		■	
6V 501 C02			■				■		
8V 501 C01		■				■		■	
8V 501 C02			■				■		■
<b>Series 60</b>									
12.7 l	■			■	■				
14 l	■	■		■	■	■			

# Series and Emissions Qualification.

Engine model	EU Nonroad St IV (97/68/EC)	EPA Nonroad T1 Comp (40CFR89)	EPA Nonroad T2 Comp (40CFR89)	EPA Nonroad T4i Comp (40CFR1039)	EPA Nonroad T4 Comp (40CFR1039)	EPA Nonroad T4 (40CFR1039)	Fuel consumption optimized	China NRMM Stage III (GB20981-2014)
<b>Series 1000</b>								
4R/6R 1000 C00	■					■		
<b>Series 1100</b>								
6R 1100 C00	■					■		
<b>Series 1300</b>								
6R 1300 C00	■					■		
<b>Series 1500</b>								
6R 1500 C00	■					■		
<b>Series 2000</b>								
12V/16V 2000 C02			■					
12V/16V 2000 C06				■				
<b>Series 4000</b>								
12V/16V 4000 C01		■					■	
20V 4000 C02		■						
12V/16V/20V 4000 C03			■				■	
12V/16V/20V 4000 C05						■		■

